

A *prima facie* case of obviousness has not been made by the Examiner. To establish a *prima facie* case of obviousness under §103(a), each of three requirements must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. (See MPEP § 2143.) Second, a reasonable expectation of success must exist that the proposed modification will work for the intended purpose. (See *Id.*) Moreover, both of these requirements must "be found in the prior art, not in applicant's disclosure." (*Id.*) Third, the reference or references, taken alone or in combination, must disclose or suggest every element recited in the claims. (See MPEP §2143.03.)

Claim 1 recites, *inter alia*,

A pattern observation apparatus comprising: . . .

a charged particle beam scanning mechanism for scanning, according to a table, a charged particle beam over a sample on which a pattern is formed;

a detection mechanism for detecting secondary electrons produced from the sample by the scanning of the charged particle beam, and outputting secondary electron detection signals;

an image information generating section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample . . .

Hiroi discloses an electron beam exposure apparatus and method. The apparatus and method include scanning a reference target to detect two-dimensional image signals. (*Hiroi*, col. 43, lines 59–67.) An inspection condition corrector 27a calculates, e.g., a dimension of the reference target based on the difference between

the detected image signal and a known dimension of the reference target. (*Id.*, col. 44, lines 2–7.) An inspection condition setter 28 sends a change rate 264 of a feature value to a compensator 262, which compensates for the parameter read out according to the change rate 264 of the feature value. (*Id.*, col. 44, lines 17–30.)

Hiroi, however, fails to disclose or suggest a combination of elements including at least, “an image information generating section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample,” as recited in claim 1 (emphasis added), nor does the Examiner identify a portion of *Hiroi* alleged to disclose or suggest this claim element.

In fact, *Hiroi* would not disclose or suggest a combination including the above element. An object of *Hiroi* is to reduce the charge involved with electron beam radiation. (*Hiroi*, Title, col. 44, lines 17–30). In operation, “the irradiated electron beam absorbed and consequently the yielded secondary electrons are significantly reduced as compared with the irradiation electron beam.” (*Id.*, col. 12, lines 15–20.)

By contrast, claim 1 recites a pattern observation apparatus that requires scanning a charged particle beam over a sample and detecting secondary electrons produced from the sample by the scanning of the charged particle beam. Thus, the charge up produces a potential distribution reflecting the structure of the sample on the surface of the sample, allowing observance of a secondary electron contrast image due to the potential distribution.

The apparatus recited in claim 1 also permits application of beam scanning in an arbitrary scan order, which has the effect of preventing an asymmetric signal from

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occurring because of a scan direction resulting from intentional charge up generation. Without intentionally generating a charge up, a person skilled in the art could not conceive the technique of arbitrarily setting the scan order. Thus, *Hiroi* does not achieve the effect of preventing generation of an asymmetrical signal, which is provided by the apparatus of claim 1.

Hiroi's object of reducing the charge involved with electron beam radiation and reducing the yielded secondary electrons also teaches away from a combination of elements including "an image information generating section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table," as recited in claim 1. Such a difference in the principle for generating the secondary beam contrast image results in a structural difference between the apparatus of claim 1 and *Hiroi*.

Further, Applicants disagree with the Examiner's characterization of *Hiroi*. For example, according to the Examiner, "It is implied herein that specifying the process and object index, and setting the scan sequence in accordance with *Hiroi* (365), is equivalent to 'generating a table in which a scan order is associated with scan positions', as recited in claims 1 and 11." (Feb. 12 Office Action, at 5.) Even if this were true (which Applicants dispute), however, this would not disclose or suggest a combination of elements including, "an image information generating section for *rearranging the secondary electron detection signals in association with the scan positions on the basis of the table*, thereby generating image information of a surface of the sample," as recited in claim 1.

Further, *Zhao* and *Hosono* fail to compensate for the deficiencies of *Hiroi*. *Zhao* discloses a method for protecting alignment mark trench walls and *Hosono* discloses an SEM for cross sectional observation of a semiconductor wafer. Neither, however, discloses or suggests at least, "an image information generating section *for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table*, thereby generating image information of a surface of the sample," as recited in claim 1. Unless the cited references disclose or suggest each claim element, a combination of these references cannot render the claim obvious nor can there be a reasonable expectation of success in obtaining the claimed combination. Thus, Applicants submit that claim 1 is allowable over the cited references. Similarly, claims 2-5, 23, and 24 are likewise allowable over the cited references at least because of their dependence from allowable claim 1. Withdrawal of the rejection of these claims is respectfully requested.

Claim 6 recites, *inter alia*,

A pattern observation apparatus for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate, the apparatus comprising:

a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample

an observation section for observing the pattern by detecting secondary electrons from the surface of the sample.

Hiroi discloses a semiconductor wafer with a pattern. The pattern may be formed by materials A3 and B4 in one embodiment (*Hiroi*, col. 12, lines 6-8, Figure 3), or by

materials A8 and B9 in another embodiment (*id.*, col. 12, lines 64–67, Figure 7). A pattern formed by materials A8 and B9, which includes a lower layer made of B8 [sic: B9] and an upper layer made of the material B4 [sic: A8] may be exposed to electron beam 5. (*Id.*, col. 12, line 67–col. 13, line 5, Figure 7.)² *Hiroi* fails to disclose or suggest, however, a combination of elements including at least, “a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample,” as recited in claim 6.

Also, Applicants submit that “a pattern [] formed on a substrate” cannot be observed without intentionally generating a charge up. As discussed above with respect to claim 1, *Hiroi* teaches away from a charge up because an object of *Hiroi* is to reduce the charge involved with electron beam radiation. (*Hiroi*, Title, col. 44, lines 17–30). In operation “the irradiated electron beam absorbed and consequently the yielded secondary electrons are significantly reduced as compared with the irradiation electron beam.” (*Id.*, col. 12, lines 15–20.) It is therefore Applicants belief that the apparatus of *Hiroi*, which reduces the charge involved with electron beam radiation, could not “observ[e] the pattern by detecting secondary electrons from the surface of the sample,” as recited in claim 6. Thus, Applicants submit that *Hiroi* similarly fails to disclose or

² Applicants note that the Examiner alleges *Hiroi* discloses, “as shown in FIG. 7, an object having a solid section structure and including a lower layer made of the material B8 and an upper layer made of the material B4 (such as an interlayer insulator which is a dielectric) is exposed to electron beam 5.” (Feb. 12 Office Action, at 6.) However, there is no disclosure of a material “B8” nor of a lower layer of B8 and an upper layer of B4 in Figure 7 (the figure under discussion in the portion of *Hiroi* cited by the

(continued...)

suggest, "an observation section for observing the pattern by detecting secondary electrons from the surface of the sample," as recited in claim 6.

Further, *Zhao* and *Hosono* fail to compensate for the deficiencies of *Hiroi*. As noted above, *Zhao* discloses a method for protecting alignment mark trench walls and *Hosono* discloses an SEM for cross sectional observation of a semiconductor wafer.

Applicants specifically dispute the Examiner's contention that there is motivation to combine *Zhao* and *Hosono* and that combination would result in the combination of elements recited in claim 6. In particular, *Zhao* relates to an alignment mark for optical detection. (*Zhao*, col. 1, lines 49–col. 2, l. 6 (including col. 1, ll. 56–61).) That is, *Zhao* does not adopt a detecting method on the basis of the secondary electron detection by means of charged beam scanning. Therefore, nothing would have led a person skilled in the art to apply the alignment mark described in *Zhao* to the technique of detecting faults in *Hiroi*. In addition, a surface above the alignment mark described in *Zhao* is not planar. Even if the alignment mark described in *Zhao* could be applied to the technique of detecting faults in *Hiroi*, the resulting combination still fails to disclose or suggest the combination of elements recited in claim 6.

In short, neither *Hiroi* nor *Zhao* discloses or suggests at least, "a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and

(...continued)

Examiner to support his allegations) or elsewhere in *Hiroi*. Instead, there appears to be a typographical error in *Hiroi*.

charging a surface of the sample," or "an observation section for observing the pattern by detecting secondary electrons from the surface of the sample," as recited in claim 6.

Absent a disclosure or suggestion of each claim element in the cited references, a combination of the references cannot render the claim obvious nor can there be a reasonable expectation of success in obtaining the claimed combination. Thus, Applicants submit that claim 6 is allowable over *Hiroi*, *Zhao*, and *Hosono*. Similarly, claims 7–10 are likewise allowable over the cited references at least because of their dependence from allowable claim 6. Withdrawal of the rejection of these claims is respectfully requested.

Claim 11 recites, *inter alia*,

A pattern observation method comprising the steps of: . . .

scanning a charged particle beam over a sample according to the table;

detecting secondary electrons produced from the sample by the scanning of the charged particle beam, and outputting secondary electron detection signals;

rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample. . . .

Hiroi discloses an electron beam exposure apparatus and method, *Zhao* discloses a method for protecting alignment mark trench walls, and *Hosono* discloses an SEM for cross sectional observation of a semiconductor wafer. But for the reasons discussed above with respect to claim 1, each reference fails to disclose or suggest and would not disclose or suggest at least, "rearranging the secondary electron detection

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signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample," as recited in claim 11.

Because the cited references alone or in combination fail to disclose or suggest each claim element, a combination of these references cannot render the claim obvious nor can there be a reasonable expectation of success in obtaining the claimed combination. Thus, Applicants submit that claim 11 is allowable over the cited references, as are claims 12–15 at least because of their dependence from allowable claim 11. Withdrawal of the rejection of these claims is respectfully requested.

Claim 16 recites, *inter alia*,

A pattern observation method for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate, the method comprising:

a first step of performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample

....

a third step of observing the pattern by detecting secondary electrons from the surface of the sample.

Hiroi discloses an electron beam exposure apparatus and method, *Zhao* discloses a method for protecting alignment mark trench walls, and *Hosono* discloses an SEM for cross sectional observation of a semiconductor wafer. But at least for the reasons discussed above with respect to claim 6, each reference fails to disclose or suggest at least, "a first step of performing a first charged particle beam radiation on a sample *in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the*

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pattern, and charging a surface of the sample," and "a third step of observing the pattern by detecting secondary electrons from the surface of the sample," as recited in claim 16.

A combination of these cited references cannot render the claim obvious nor can there be a reasonable expectation of success in obtaining the claimed combination, absent a disclosure or suggestion of each claim element in the references. Thus, Applicants submit that claim 16 is allowable over the cited references, as are claims 17–22 at least because of their dependence from allowable claim 16. Withdrawal of the rejection of these claims is respectfully requested.

In view of the foregoing remarks, Applicants respectfully request the reconsideration of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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